Analysis of a Training Package for Law Enforcement to Conduct Open Source Research

Joseph Williams*
Canterbury Christ Church University, UK

Bio: Joseph Williams achieved his Bachelor's degree in Computing at Canterbury Christ Church University (CCCU) in 2013, and a Master's degree in Advanced Software Development at the University of Kent in 2014; where he was also an Assistant Lecturer. Joseph has been a University Instructor in Computing at CCCU since late 2014, where he combines lecturing and working on his PhD.

Joseph's research interests surround how law enforcement conduct open source research from a legal, technical and procedural perspective. This research has seen the creation of a free software tool called Open Source Internet Research Tool (OSIRT) that is used by law enforcement across the globe in order to rigorously conduct online, open research.

Georgina Humphries
Canterbury Christ Church University, UK

Bio: Georgina Humphries has held the position of University Instructor in Computing at Canterbury Christ Church University, UK, since 2014. She holds a Bachelor's of Science in Computer Forensics from Canterbury Christ Church University and is studying for a PhD. Her main research activities focus on digital forensics in higher education, and the training of law enforcement. She holds a particular interest in the effectiveness of both education and training for producing suitable practitioners. Georgina has worked closely with a number of academics and law enforcement professionals on training officers through the European Cybercrime Training and Education Group (E.C.T.E.G) by creating and training course content.

ABSTRACT

Law enforcement officials (LEOs) in the UK conduct open source research (OSR) as part of their routine online investigations. OSR, in this instance, refers to publicly available information that is accessed via the Internet. As part of the Research, Identifying and Tracing the Electronic Suspect (RITES) course provided by the UK's College of Policing, LEOs are introduced to the Open Source Internet Research Tool (OSIRT); a free software tool designed to assist LEOs with OSR investigations. This paper draws on analysis from questionnaires and observations from a RITES course; mapping them to Kirkpatrick's evaluation model. Results showed the positive impact the RITES course had in transferring knowledge back on-the-job, with LEOs applying knowledge learned to real-life investigative scenarios. Additionally, results showed OSIRT integrated both in the RITES course and into the LEOs investigative routine.

Keywords: Online Investigations, Open Source Intelligence, Online Research, Kirkpatricks Evaluation Model

INTRODUCTION

The World Wide Web plays host to a veritable breadcrumb trail of potential evidence which could provide intelligence to Law Enforcement Officials (LEOs). From Facebook posts to Tweets, all are avenues that may prove useful and warrant exploration. One tool to help navigate these routes is Open Source Research (OSR). OSR is concisely defined by the Association of Chief Police Officers (ACPO) as "The collection, evaluation and analysis of materials from sources available to the public, whether on payment or otherwise, to use as intelligence or evidence within investigations" (ACPO, 2013, p.8).

To aid digital investigators in conducting OSR, the UK's College of Policing, a professional training body for police in England and Wales, runs a five-day *Researching, Identifying and Tracing the Electronic Suspect* (RITES) course. The RITES course provides an opportunity for LEOs, regardless of skill-level, to gain proficiency in lawfully obtaining intelligence and artefacts from the web. In addition to investigatory skills, the RITES course adopts the usage of the free and open source investigative software package *Open Source Internet Research Tool* (OSIRT); a tool designed specifically to assist in conducting OSR.

A growing trend for the use of OSR is continuously expanding among UK law enforcement agencies. In order to conduct rigorous OSR investigations, law enforcement require a multitude of tools and techniques. A problem surrounding OSR is the cost associated with software tools, along with the legal, ethical, and procedural issues that are exacerbated by the reduction in police funding. It is imperative, then, that the training LEOs receive is robust and applicable in the digital age. The objective of this study is to offer an insight into how LEOs are trained to conduct OSR and whether the training package, in conjunction with OSIRT, is effective for those officers both during the course and when they are back on-the-job.

BACKGROUND

Designing Training Courses for Law Enforcement and Applying Learning Styles

Similarly to courses structured for training law enforcement in digital forensic investigations (Genoe, Toolan, & McGourty, 2014; Stephens, 2012), the RITES course requires an ability to problem solve, pay attention to detail, and have a mindset for investigation and intelligence. Considerations are directed by course aims "to provide investigating officers with the skills necessary to obtain, evaluate and use online information … apply[ing] best practice in respect of proper authorization and recording processes for online investigations" (College of Policing, 2017, para. 3).

For a number of years, police training programs adopted a "militaristic environment" (Birzer, 2003, p.30) which a number of authors (Birzer, 2003; Haberfeld, Clarke, & Sheehan, 2011; Vodde, 2009) state is not conducive to learning, as "it is essential that training is conducted in such a way as to be as meaningful as possible to the adult participants" (Birzer & Roberson, 2007, p. 226). The RITES course adopts both andragogic (i.e. self-directed learning and sharing

of experiences) and pedagogic (i.e. dictating learning in the form of traditional lectures) approaches to learning which seemingly prove efficacious when training police officers (Birzer, 2003; Haberfeld et al., 2011; Queen, 2016). Tong, Bryant, & Horvath (2009, p.210) state that "training and learning styles need to reflect that uncertainty of police work and the principles that should inform practice." Traditionally, lecture style approaches to educating learners are "almost always the most inefficient way of learning" (Grace, 2001, p.125), and while it is unlikely for the RITES course to accommodate every style of learning, a concerted effort is made to engage their audience. By embracing modern approaches, College of Policing trainers afford the officers a better chance of applying their acquired skills to real-life scenarios.

Design of the RITES Course

The course is split into one to two-hour chunks of key topic areas, covering approximately five topic areas a day (Figure 1). Each topic area is then either proceeded or injected with practical sessions or discussion from the cohort, which is facilitated by the instructors. Practical sessions also include building upon a fabricated case using OSIRT over the five days. On the final day, the group members are examined by means of an unseen open source investigation. The artefacts they obtain through OSIRT from the 'investigation' are then applied to answer questions on a computer-aided, open book, multiple-choice examination. The course is then concluded with a reflection of the previous five days. Figure 2 represents the layout of the learning environment.

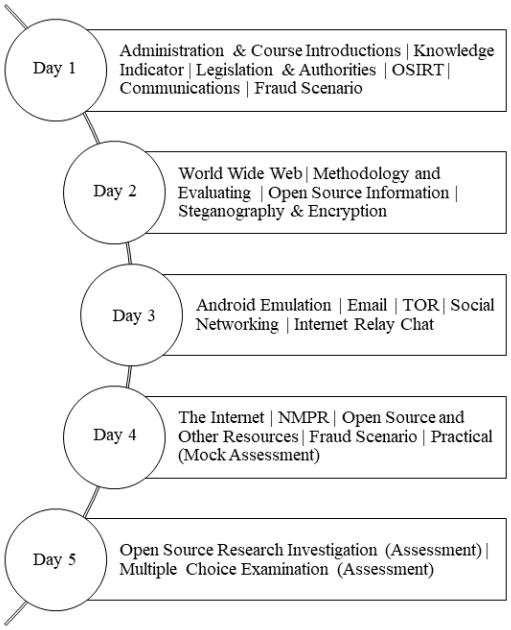

Figure 1 - RITES Course Structure

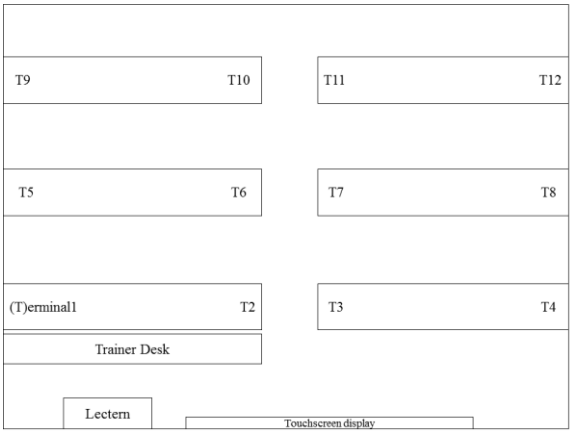

Figure 2 - RITES Course Room Layout

Using Software for Investigative Work

In an ever-growing digital age, and with changing expectations in police competencies, LEOs require essential skills and abilities to conduct online investigations. However, the skill-level of officers requiring such training is diverse with many not being, or having had the need to be, skillful with computers during their daily roles. The requisite for software based solutions has a

crucial element to aid the proficiency of conducting OSR and go some ways towards making "officer[s] more efficient, more effective, more knowledgeable, and better able to spend [their] time … and by improving reporting capabilities" Roberts (2011, as cited in Hess et al., 2013, p.16).

Using Kirkpatrick's Training Evaluation Model

A number of courses within the policing context (Capacity Building and Training Directorate, 2012; Genoe et al., 2014; Stephens, 2012) have utilized Kirkpatrick's evaluation model. Developed in the 1950s (Kirkpatrick & Kirkpatrick, 2006; Kirkpatrick & Kirkpatrick, 2016), it is now the "most widely used framework" due to its design and levelled implementation (Tamkin, Yarnall, & Kerrin, 2002, p.3). Furthermore, Kirkpatrick's model encourages learner participation via four levels: Reaction, Learning, Behavior, and Results. The model is popular as it places value on learners' views, suggestions and opinions. The four levels look at several key areas to evaluate effectiveness such as;

- Reaction – Level 1: participants thoughts on the course, its relevance and their own engagement
- Learning – Level 2: knowledge, skills and abilities (e.g. performance), attitudes and confidence
- Behavior – Level 3: changes in job behavior due to training and the applicability of learned skills/content
- Results – Level 4: impact of the training and content on the business

METHOD

A mixed method approach was adopted, using questionnaires, evaluations, and observations. These methods were chosen due to their ease of mapping with Kirkpatrick's evaluation model. Evaluations in this study included key questions to examine the courses effectiveness based on the Hybrid Kirkpatrick's Evaluation tool (Kirkpatrick Partners, LLC, 2010), which provides example questions for levels one to four. For example, knowledge retention and applicability to real world environments were sought through free-form answers and Likert scale statements. Limitations of Kirkpatrick's model are abated by looking at the value of information across each level; avoiding the linear approach criticized by Tamkin et al. (2002). Using this approach ensures the most valued information of course effectiveness is collated. This study evaluates levels three and four from the perspective of attending officers; taking into consideration their experience, rank and own ability to assess their behavioral change, including the impact of the course on the working environment. Participants were made up of an opportunity sample of twelve serving LEOs attending a RITES course, containing six males and six females. Participant jobs ranged from Detective Constables and Sergeants, to Analysts. The average service time was sixteen years; with a minimum of 8 and a maximum of 26 years.

A pre-course questionnaire was completed electronically to gain insight into the participant's expectations of the RITES course and to establish current skill-levels at conducting OSR. Additionally, the questionnaire asked participants of any software they currently use to conduct OSR, if any. At the end of each training day, the cohort completed a paper-based questionnaire asking to evaluate each day's topic areas ("Easy" to "I'm lost"), the pace of the session ("Too slow" to "Too fast") and whether OSIRT was effective in that day's session ("Strongly disagree"

to “Strongly agree”). The participants were also afforded an opportunity to freely express their thoughts for the day.

An electronic immediate post-course questionnaire was distributed on the final day; covering a range of areas such as course content coverage, course assessment, and the applicability of OSIRT. All statements conformed to a ranked multiple-item Likert scale, and took a flipped phrased approach to reduce response bias (Field, 2006). Finally, eight weeks after course completion, an on-the-job questionnaire was distributed electronically to identify if the RITES course had an impact on their role.

Both immediate and delayed post-course evaluations contain multiple-item measures across the four levels of Kirkpatrick’s model. In the case of this study, factor analysis was infeasible due to population size, however, Gliem & Gliem (2003) note the importance of calculating Cronbach’s alpha for scale items. Cronbach’s alpha is a popular statistical analysis to measure reliability among variables of interest (Tavakol & Dennick, 2011). Cronbach’s alpha is adopted in this study to measure statements relating to the different levels of the Kirkpatrick’s model. Analysis of Cronbach’s alpha was conducted using IBM SPSS 24.0.

Furthermore, for flipped phrased items and to prevent a negative impact on the reliability score, the negative statements were reversed before calculation. Common levels of internal reliability/consistency of alpha (α) were employed with acceptable values of 0.7, through to excellent values of $\alpha >= 0.9$ (George & Mallery, 2016; Loewenthal & Lewis, 2015; van Griethuijsen et al., 2015).

Observations were adopted providing instructors with the chance to look at each participant’s level of engagement, demonstration of skills, through to how the course, and OSIRT would be useful on-the-job. Mindful of the role the observer plays on the learner, considerations were made towards how the learner’s behavior can be affected, by the presence of an observer within the training environment. Hallenberg, O'Neil, & Tong (2016, p.109) write that “Van Maanen describes four typologies” of a researcher. In this study the author, as an observer, can be classified as a ‘fan’, i.e., a researcher who is “interested in observing police practice as it happens” (Hallenberg et al., 2016, p.109). The observer kept a daily diary of events, with reflections made to correlate with learner comments and ratings from course evaluations.

RESULTS AND DISCUSSION

Pre-Questionnaire Results

Challenges faced by participants when conducting OSR generally fell into one of three categories: the need to be trained in OSR, an absence of IT knowledge, or software tool ‘overload’. Current software tool usage is consistent with feedback previously received in that officers use a varied array of software that is either free or built into the computer’s operating system. Three respondents said they did not use any software, with one noting they do not have access to the necessary technology. No participants have previously used OSIRT as part of their investigations.

All participants said they prefer practical learning where a “realistic” and “hands-on” approach can be applied to real-life investigative scenarios. Responses show that expectations of learning were centered around having the necessary tools available to “research and capture” and “how to best use these practically” to “maximise [the] chances of finding what [they] want to find”. Additionally, participants wanted to know “the ‘correct and best’ way of completing research” using “OSR techniques” that was both “safe [as well as showing] potential pitfalls when conducting OS research”.

Finally, “certification”, “knowledge”, and “confidence” were stressed as attributes officers were wanting to achieve throughout the course. Other responses showed concern with monitoring their own digital footprint while conducting an open source investigation. Replies also showed that participants were using the course to pass knowledge and understanding back to colleagues in the working environment.

Daily Evaluations and Observer Comments

Course Pace and Difficulty

Daily averages and the immediate post-course evaluation show the overall difficulty noted by most participants to be ‘Just Right’. Figure 3 demonstrates, overall, two learners felt the course was ‘Very Difficult’, speculatively this may have been linked with their perceived computer literacy (Figure 4) and three felt the course to be ‘A Little Tough’. These results are not unexpected, as observations showed a small number of the cohort readily admitting they were computer novices, one going as far to say they were a ‘technophobe’. Other comments lend themselves towards aspects of learning, where one respondent felt the course to be tough as their basic knowledge was poor, however, they emphasized that the trainers were helpful in assisting as much as possible, and being patient with them. The respondent felt these points helped make the course thoroughly enjoyable and “took a lot” from it.

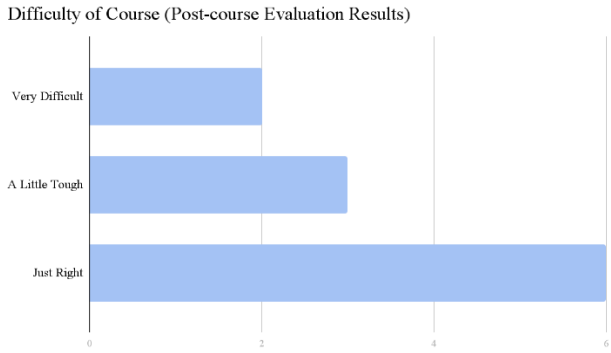

Figure 3 - Overall Difficulty of the Course

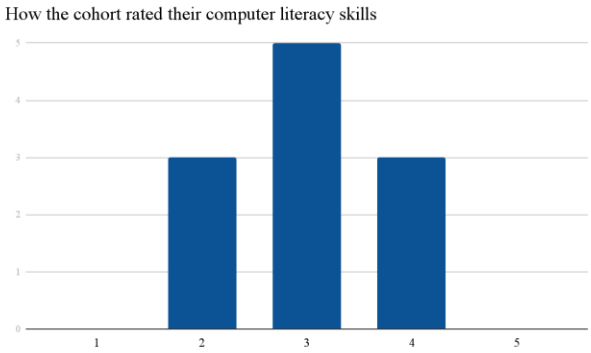

Figure 4 - Cohorts' Rating of own Computer Literacy

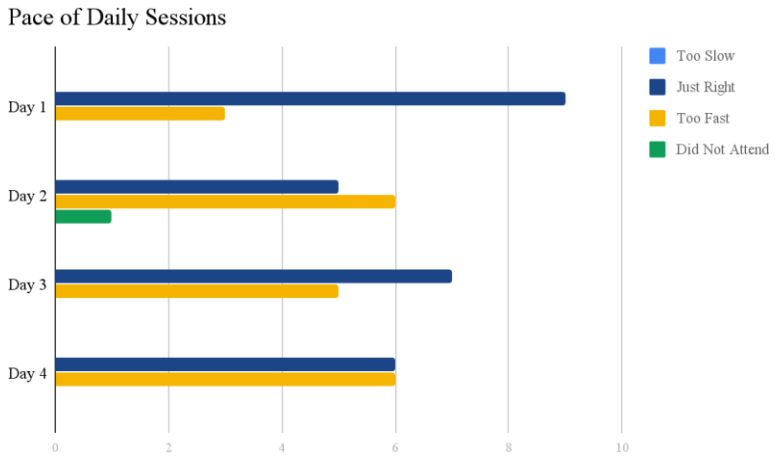

Figure 5 - Perception of Daily Session Pace

The cohort throughout the week were engaged and responsive to interactive sessions. Additionally, observations showed that the trainers addressed issues with pacing, providing one-to-one guidance when needed. While the cohort were frequently split about pacing of the daily sessions, as seen in Figure 5, pace was observed to be problematic on days where complex topics, such as encryption, were taught. Participants offered feedback in their daily evaluations for these challenging topics, one noting they "saw some people confused about terminology" and suggested that "perhaps … more basic explanation[s]" could be provided. Given the technical complexity of some of the topics, it is understandable the cohort would find these difficult to immediately absorb. As with any learning, the time taken to master and acquire knowledge differs per learner, and added with technical complexity of a topic, a "too fast" response would not be atypical given these circumstances**.**

Observations showed that there was good communication during these particularly tough sessions, with the use of analogies by the trainers making complex topics relatable to everyday life. One participant highlighted this in their comments, saying "comparing 'digital' to 'real-life events' assists in understanding". Feedback also showed that although some sessions were "hard work", they were still "very interesting" and "enjoyable".

OSIRT

To capture the usage and effectiveness of OSIRT, officers were asked to rate the tool using a Likert scale, from strongly disagree to strongly agree, and provide comments based on the statement "OSIRT has been effective in today's training" considered by the learners.

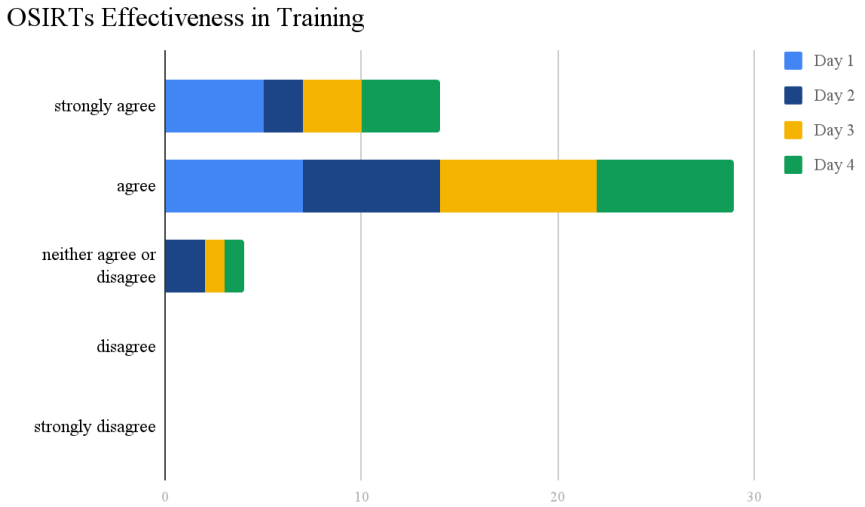

Figure 6 - OSIRTs Effectiveness

Results showed that OSIRT was successfully applied and received by learners throughout the course. Across the four days, which were analyzed for OSIRT's effectiveness, 91 percent felt they "agree" or "strongly agree" with the statement presented (Figure 6). Prior to the course, none of the officers had used OSIRT. Daily evaluations support this assertion, with many officers using freeform answers to praise the tool noting its usefulness with comments such as: "it is extremely useful for structuring search and investigation process", "[it is] very useful and makes things easy", "it streamlines the process and makes it easier as an investigator", "[it is] very very useful! - couldn't have done it without OSIRT", and "everything can be done in OSIRT".

In the post-course evaluation, learners were asked "Was OSIRT useful during the course?". Everyone responded "yes", expressing their praise for the tool with eight participants stating they would be using OSIRT to enhance the capabilities within their role for conducting OSR. Two participants expressed they were 'unsure' and one stated they would not be using the tool. The reasons for not being able to use OSIRT were concerns over IT restrictions. A positive response from the cohort on the toolkit also meant that OSIRT was mentioned as a specific skill they would apply back on-the-job and as an important aspect learned on the course. The toolkit satisfies several challenges noted by the learners in their pre-course questionnaire, for instance: the current state of use of a number of tools etc., where a number of participants noted the tool as "excellent" and "fantastic" which is "well designed" with participants "amazed" that the software is free.

Participant Course Evaluation

Eleven officers completed the immediate post-course evaluation, with eight completing the delayed post-course evaluation. Participants identified their attendance on the course was "to acquire new skills" (nine), "to improve current knowledge" (seven), "to familiarise [themselves] to train other in OSR" (five), and "to become certified in OSR" (four). One officer expressed the course was "mandatory", with two others stating, "to use at work" and "to ensure those in my office with no training do not have to carry the responsibility of conducting and capturing open

source research without that training" respectively. The course, at the time of writing, is the only accredited course in the UK to help officers conduct online investigations efficiently and with ease and knowledge of processes and relevant data. Findings demonstrate the course is delivered well, meeting expectations of officers.

Reaction – Level 1

Level one statements look at, for instance, the engagement of officers and relevance of training. When applying Cronbach's alpha to four statements categorized as 'reaction', an alpha (α) score of 0.70 was found; an acceptable reliability. Further to this, results from the immediate post-course evaluation demonstrate a strong percentage of officers who agree they took responsibility for their learning and that trainers enhanced the learning on the course.

Results from both evaluations showcase OSIRT's usefulness and effectiveness at helping investigating officers "capture online resources" as well as helping to retain and maintain audit trails. Respondents expressed that capturing and finding open source information was the most relevant information taken from the course, with all recalling OSIRT and evidential capture as their most memorable content.

To assess training satisfaction, participants were asked open-ended questions on whether anything could be improved on the course. Several yielded responses such as "no, it was pitched about right" and "no I liked it". While three officers felt the course could run longer due to the quantity of content covered. Others provided positive and constructive improvements, mentioning they would have liked more on topics such as social media, cryptocurrency and "more about research of an individual". Officers express no real issues, showcasing the courses effective delivery for this cohort.

Expanding on this, the delayed post-course evaluation also sought feedback to discover what topics could be added. Officers felt the course needed more on the "levels of open source research", "case law", "how websites are created" and "social media". Many of the suggestions will be considered for future delivery of the course.

Learning – Level 2

To achieve level two of Kirkpatrick's model (i.e., identifying learning and its effectiveness), several questions and statements focused on knowledge, skills, confidence, relevance, and learning styles. A key element useful to identifying the effectiveness of the course content was to ask learners to pick three important concepts/topics they learned during the course. Results show that using OSIRT was the most mentioned topic (nine), followed by steganography (four), and social networking (three). These topics were also specific skills which officers plan to use in their job when asked.

Eight statements covering aspects from quality of content, delivery, and confidence of application were asked of participants. A tally of the collated responses for level two demonstrated that 86% of the cohort achieved learning on the course, with 91% feeling that there was sufficient time allocated to delivering the course content. Applying Cronbach's alpha shows a score of 0.88 across statements demonstrating a strong reliability between item correlation

across eleven participants. Additionally, it was a strong indication that officers felt they learned skills transferable to the workplace.

To build a comparison between the immediate post evaluation questionnaire, officers were asked to identify what content they remembered the most. Mentioned were: OSIRT (1) and searching, capturing (6) and analyzing (1) open source information. Although OSIRT was not explicitly mentioned by all officers, capturing open sources was mentioned by all. The only tool used on the course to capture evidential data was OSIRT, so it can be inferred that OSIRT was an aid to their learning. Further testament to this are free comments provided which mention how it was "nice to discover OSIRT".

Behavior – Level 3

So far results have shown participants were satisfied with the training and OSIRT, while demonstrating digestion of the subject matter. Level three is used to determine how much knowledge, skills, and attitudes have been transferred following training and how on-the-job behavior has consequently changed.

A strong consensus was illustrated by participants, in the delayed post-course evaluation, towards the practical application of course learning and OSIRT within four weeks. A few mentioned short delays due to work commitments, however, found the course materials sufficient in refreshing learning. Other officers noted no difficulties or "nothing unusual" when applying gained skills. One officer positively reflected by articulating "there were some things on the course [they] wondered why [they] were shown but it made more sense a few weeks after the course". Demonstrating development and maintenance of relationships between the training and business requirements.

Officers were then asked to consider and rate, using a Likert scale from 'little or no application' (recoded to 1) to 'very strong degree of application, and desire to help others do the same' (recoded to 5), their on-the-job behavior in accordance with course objectives. In the first instance, Cronbach's alpha returned a negative result. Field (2006) states that in cases where poor correlation between items [is found,] then some should be revised or discarded. In this instance two statements were removed leading to $\alpha = 0.76$ and demonstrating a strong internal reliability among the items.

The two statements excluded asked officers to consider their "Ability to navigate the web in order to capture and evaluate relevant data" and "Obtain familiarity with social networking sites". While these introduced a negative alpha, a breakdown of the statements demonstrates a positive impact from course back in the workplace. Results showed that each officer felt a strong degree of application (7) or very strong degree of application with desire to help others (1) with their ability to capture and evaluate relevant data. Furthermore, these concepts were formatively fed back by officers in free-form throughout post-course questionnaires.

A varied response was given for the statement "obtain familiarity with social networking sites", where three officers expressed a 'moderate degree of application' and five who expressed a 'strong degree of application'. The reason for this disparate response is not known, but speculatively it may be due to the statement's phrasing. For example, "moderate degree of

application" for the statement "Obtain familiarity with social networking sites" does not align. On reflection, a statement such as "Usage of social networking sites" would have been less ambiguous.

Results – Level 4

This level looks at the impact of the course and OSIRT on the business through perspectives of the attending officers. Both post-course evaluations are used to assess 'results' e.g., the perceived, and resulting, impact of the application of learning to the job for departments and/or organization.

Immediate post-course evaluation found all, bar one, officers express the course would make a difference to the way they do their job. Officers expected to see positive impact in areas such as "greater confidence in conducting OSR" and "feeling better equipped to understand, speed-up and improve the OSR process". Responses from delayed post-course evaluation corroborate this, finding OSIRT and capturing of open sources as the main enhanced areas in officers' jobs. Course materials and OSIRT "slotted into [their] role quite nicely" and the "course … help[ing] with some of the finer details". OSIRT's success as an investigative tool, its influence on officers' roles and asset to police departments was epitomized by one officer noting: "our team now uses OSIRT and the majority of us use it most days".

Officers saw improvements in most areas of their work, as demonstrated by Figure 7. Interestingly, only three respondents saw an increase in the quality of their work. The authors speculate this is caused by professional bias, whereby officers may have felt the work they previously produced before the course to already be of high quality, and hence nothing to improve upon.

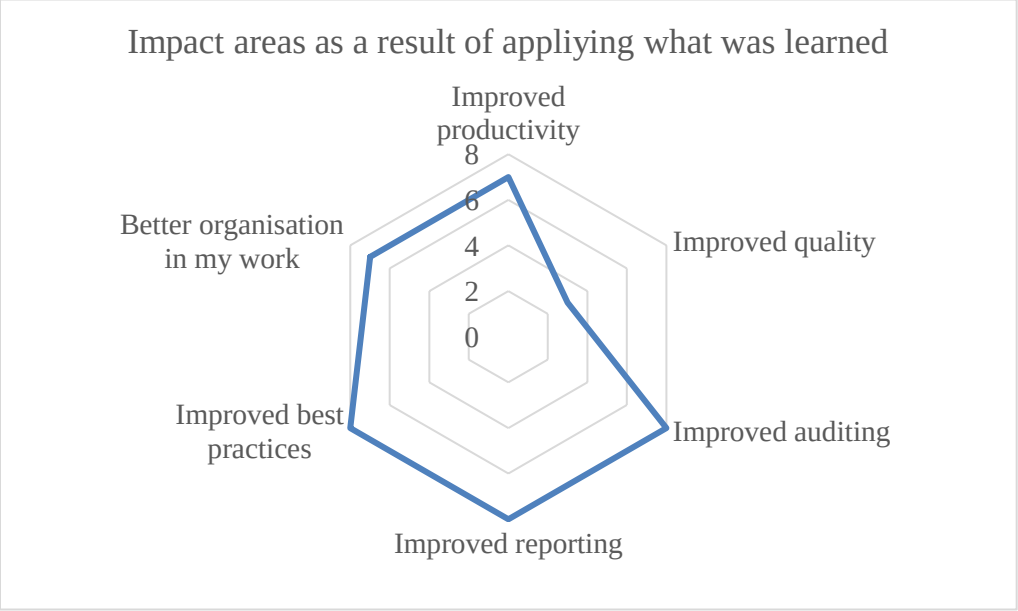

Figure 7 - Impacts felt due to application of learning by officers

DISCUSSION

The daily course evaluations represented well-rounded views that sessions matched the learning styles officers had noted in the pre-course survey. Occasionally, topics challenged a few of the cohort, but this was abated with trainers providing one-to-one sessions. Observations also confirmed that some of the cohort were forthright with their IT abilities. This may explain why the advanced topics, such as encryption, were a challenge to those participants.

While the pre-survey showed little OSR experience among the officers, results indicated that all LEOs learned OSR skills during the course. This was highlighted by the fact that all the cohort passed the examination. For a majority of officers present, the overall pace of the program was just right for their learning style and speed. However, given the variety of skill-sets on the course, several participants did feel the course went a little fast for them. Suggestions for improvements to slow down the pace of certain sessions were relayed to trainers. Although these problem areas were identified, the consensus was the course provided a number of key topics and skill-sets which LEOs can utilize in the workplace. Results demonstrated that many turned back to their course notes and materials on-the-job, again showing the application of knowledge and skills learned.

The success of the RITES course was further strengthened with the use of OSIRT and its function in aiding OSR. Responses sought throughout this study, from daily surveys to direct and delayed post-course evaluations, saw the cohort provide positive responses to the tool's effectiveness. Further praise was vocalized by LEOs to the usefulness and ease-of-use of the tool, particularly for helping officers in its versatility and ability to methodically conduct OSR.

LIMITATIONS AND FUTURE RESEARCH

The main limitation of this article is the number of participants, a small group of officers. Future research will look at multiple cohorts of officers trained under the RITES course to analyze, compare and discuss findings toward the effectiveness of the course and OSIRT in helping investigating officers conduct OSR.

CONCLUSION

This article looked to evaluate the overall effectiveness of the RITES course offered by the UK's College of Policing, OSIRT's integration into the course, and its subsequent usage on-the-job by LEOs. Results showed the RITES course as an effectual training aid to LEOs conducting OSR, and OSIRT as an effective tool for LEOs who conduct open source investigations as part of their role. Evaluation of the course took the approach of Kirkpatrick's model, where study responses showed knowledge transfer to real-life investigations, skill-sharing and the integration of OSIRT within their teams.

As the march of technology forges ahead, so must the education of those having to navigate its ever more complex wake. The police must evolve symbiotically with modern life to stay on top of the types of crime that now dominate the headlines. To grow effectively, their learning techniques and educational ethos must harness the most efficient teaching styles and tools; the RITES course and OSIRT is helping do just that. By engaging learners and diversifying their

classroom experience, the police are encouraging the best retention for information. Incorporating OSIRT into this experience can improve the efficacy of learned skills in providing a successful and efficient tool. The RITES course and OSIRT are an ideal integration of modern learning and modern tools, to help police keep up with this modern world.

ACKNOWLEDGMENT

Thank you to the College of Policing and all the participants, and an extended thank you Russell Taylor, the lead trainer on the RITES course.

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

REFERENCES

ACPO. (2013). *Online Research and Investigation Guidance* (No. 1.2). Retrieved from http://library.college.police.uk/docs/appref/online-research-and-investigation-guidance.pdf

Birzer, M. L. (2003). The theory of andragogy applied to police training. *Policing: An International Journal of Police Strategies & Management*, *26*(1), 29–42. https://doi.org/10.1108/13639510310460288

Birzer, M. L., & Roberson, C. (2007). *Policing today and tomorrow*. Pearson/Prentice Hall.

Capacity Building and Training Directorate. (2012). *Transfer Evaluation* (International Police Training Journal No. 3). Lyon, France: INTERPOL.

College of Policing. (2017). Researching, Identifying and Tracing the Electronic Suspect. Retrieved September 1, 2017, from http://www.college.police.uk/What-we-do/Learning/Professional-Training/digital-and-cyber-crime/Pages/Researching-Identifying-Tracing-Electronic-Suspect.aspx

Field, A. (2006). Reliability Analysis | C8057 (Research Methods II): Reliability Analysis. University of Sussex. Retrieved from http://www.discoveringstatistics.com/docs/reliability.pdf

Genoe, R., Toolan, F., & McGourty, J. (2014). Programming for Investigators: From Zero to Hero in 4 Days. Presented at the Cybercrime Forensics, Education and Training (CFET), Canterbury Christ Church University. Retrieved from

https://www.researchgate.net/publication/271511408_Programming_for_Investigators_From_Zero_to_Hero_in_Four_Days

George, D., & Mallery, P. (2016). *IBM SPSS Statistics 23 step by step: A simple guide and reference*. Routledge.

Gliem, J. A., & Gliem, R. R. (2003). Calculating, Interpreting, and Reporting Cronbach's Alpha Reliability Coefficient for Likert-type Scales. Presented at the Midwest Research-to-Practice Conference in Adult, Continuing, and Community Education, Columbus, OH: The Ohio State University.

Grace, M. (2001) Continuing professional development: Learning styles. *British Dental Journal, 191(3), 125–128.*

Haberfeld, M. R., Clarke, C. A., & Sheehan, D. L. (2011). *Police organization and training: innovations in research and practice*. Springer Science & Business Media.

Hallenberg, K., O'Neil, M., & Tong, S. (2016). Watching the detectives: researching investigative practice. In *Introduction to Policing Research: Taking Lessons from Practice* (pp. 101–114). Abingdon, Oxon: Routledge.

Hess, K. M., Orthmann, C. H., & Cho, H. L. (2013). *Police operations: theory and practice*. Cengage Learning.

Kirkpatrick, D., & Kirkpatrick, J. D. (2006). *Evaluating training programs: The four levels* (3rd ed.). San Francisco, California: Berrett-Koehler Publishers.

Kirkpatrick, J. D., & Kirkpatrick, W. K. (2016). *Kirkpatrick's four levels of training evaluation.* Association for Talent Development.

Kirkpatrick Partners, LLC. (2010). Kirkpatrick Hybrid Evaluation Tool Template. Kirkpatrick Partners, LLC. Retrieved from http://www.kirkpatrickpartners.com/Portals/0/Resources/Certified%20Only/Kirkpatrick%20Hybrid%20Evaluation%20Tool%20Template.docx

Loewenthal, K., & Lewis, C. A. (2015). *An introduction to psychological tests and scales*. Psychology Press.

Queen, C. R. (2016). *Effectiveness of problem-based learning strategies within police training academies and correlates with licensing exam outcomes*. Western Michigan University.

Stephens, P. (2012). An evaluation of Linux cybercrime forensics courses for European Law Enforcement. In N. Clarke & S. Furnell (Eds.), *Proceedings of the Sixth International Symposium on Human Aspects of Information Security & Assurance (HAISA 2012)* (pp. 119–128). Plymouth University.

Tamkin, P., Yarnall, J., & Kerrin, M. (2002). *Kirkpatrick and beyond: A review of models of training evaluation* (IES Research Networks No. 392). Brighton, United Kingdom: The Institute for Employment Studies. Retrieved from https://pdfs.semanticscholar.org/6845/52ac8528bfaed28fc8337a1a57b94c27aa39.pdf

Tavakol, M., & Dennick, R. (2011). Making sense of Cronbach's alpha. *International Journal of Medical Education*, *2*, 53–55. https://doi.org/10.5116/ijme.4dfb.8dfd

Tong, S., Bryant, R. P., & Horvath, M. A. H. (2009). *Understanding criminal investigation*. John Wiley & Sons.

van Griethuijsen, R. A. L. F., van Eijck, M. W., Haste, H., den Brok, P. J., Skinner, N. C., Mansour, N., … BouJaoude, S. (2015). Global patterns in students' views of science and interest in science. *Research in Science Education*, *45*(4), 581–603. https://doi.org/10.1007/s11165-014-9438-6

Vodde, R. F. (2009). *Andragogical Instruction for Effective Police Training*. Cambria Press.